

1. A method for embedding a watermark signal that contains message data in a digital image represented as a two-dimensional array of pixel values, comprising the steps of:

b) modifying each pixel value of the dispersed message image as a function of the corresponding pixel value in the digital image; and

2. The method claimed in claim 1, wherein the step of providing a dispersed message image, comprises the steps of:

3. The method claimed in claim 2, wherein the carrier image has random phase.

4. The method claimed in claim 3, wherein the carrier image has a Fourier amplitude that models the Fourier amplitude of a specified system noise.

5. The method claimed in claim 3, wherein the carrier image has a Fourier amplitude that models the high frequencies of the Fourier amplitude of a specified system noise and contains a ramp from zero for low frequencies.

7. The method claimed in claim 1, further comprising the step of extracting the message data from the watermarked image.

9. The method claimed in claim 8, further comprising the step of extracting the message image from the watermarked image by correlating the carrier image with the watermarked image.

11. The method claimed in claim 4, wherein the specified system noise is representative of film grain noise.

13. The method claimed in claim 6, wherein the specified system signal-dependent noise is representative of film grain noise.

a) means for providing a dispersed message image having pixel values representative of the message data;

c) means for combining the modified dispersed message image

a3) means for convolving the message image with the carrier image to produce the dispersed message image.

23. The system claimed in claim 22, wherein the carrier image has a Fourier amplitude that models the Fourier amplitude of a specified system noise.

25. The system claimed in claim 20, wherein the means for modifying each pixel of the dispersed message image comprises means for multiplying the pixel by a scaling factor representative of a specified system signal-dependent noise.

26. The system claimed in claim 20, further comprising means for extracting the message data from the watermarked image.

28. The system claimed in claim 27, further comprising means for extracting the message image from the watermarked image by correlating the carrier image with the watermarked image.

30. The system claimed in claim 23, wherein the specified system noise is representative of film grain noise.

32. The system claimed in claim 25, wherein the specified system signal-dependent noise is representative of film grain noise.

33. The system claimed in claim 25, wherein the specified system signal-dependent noise is representative of image sensor noise.

35. The system claimed in claim 34, further comprising the step of extracting the message image from the watermarked image by correlating the carrier image with the watermarked image.

37. The system claimed in claim 20, wherein the digital image has been processed to remove system noise prior to embedding the watermark signal, thereby producing a watermarked image having the appearance of containing system noise.

39. A computer program for performing the method of claim 1.

40. A watermarked image produced by the method of claim 1.